

CLAIMS

We claim:

- 1 1. A cellular network comprising:
2 a plurality of subscribers communicating with the base station using
3 orthogonal frequency division multiple access (OFDMA);
4 at least one base station having logic to coordinate multiple-access
5 and information exchange between the at least one base station and the
6 plurality of subscribers, the logic selecting a set of OFDMA traffic channels
7 from a plurality of candidate OFDMA traffic channels based on feedback
8 channel information collected from the plurality of subscribers.
- 1 2. The network defined in Claim 1 wherein the logic calculates
2 spatial gains of uplink and downlink channels based on responses of
3 spatially separated receivers at the base station.
- 1 3. The network defined in Claim 1 wherein the feedback
2 information comprises channel fading information and noise and
3 interference levels for each of the plurality of candidate OFDMA traffic
4 channels.

1 4. The network defined in Claim 1 wherein the plurality of
2 subscribers send the feedback information in response to a sounding signal
3 from the at least one base station.

1 5. The network defined in Claim 1 wherein the at least one base
2 station selects a combination of modulation and coding schemes based on
3 the SINR of the selected traffic channel for each accessing subscriber.

1 6. The network defined in Claim 1 wherein the logic comprises
2 medium access control (MAC) logic.

1 7. A method comprising:
2 sending sounding signals to a plurality of subscribers;
3 receiving channel condition information for a plurality of OFDMA
4 traffic channels; and
5 performing OFDMA multi-user traffic channel assignment to assign
6 traffic channels from the plurality of OFDMA traffic channels to the plurality
7 of subscribers based on the channel condition information and estimated
8 spatial gains for the uplink and downlink signals.

1 8. The method defined in Claim 7 wherein the channel condition
2 information comprises information regarding estimated channel gains and
3 channel interference for the plurality of OFDMA traffic channels.

1 9. The method defined in Claim 7 wherein performing traffic
2 channel assignment is based on channel conditions between one or more
3 antennas at a base station and one or more antennas at subscriber locations.

1 10. The method defined in Claim 7 further comprising estimating
2 spatial gains for uplink and downlink signals.

1 11. The method defined in Claim 10 further comprising estimating
2 signal-to-noise-plus-interference rates (SINRs) for the uplink and downlink
3 signals, and wherein performing channel assignment is based on the SINRs
4 for the uplink and downlink signals.

1 12. The method defined in Claim 11 wherein estimating SINRs for
2 the uplink and downlink signals is performed on all OFDMA traffic
3 channels for all active and accessing subscribers.

1 17. The method defined in Claim 7 wherein performing traffic
2 channel assignments comprises a plurality of base stations coordinating to
3 perform the traffic channel assignment.

21. The method defined in Claim 7 wherein estimating spatial gains for uplink and downlink signals comprises:

- estimating broadband spatial channels across the plurality of OFDMA traffic channels for each accessing subscriber;
- determining the spatial processing gains for uplink and downlink signals on each of the plurality of OFDMA traffic channels;
- predicting signal-to-noise-plus-interference ratio (SINR) for uplink and downlink transmission with spatial processing over each of available

9 OFDMA traffic channels by adding the spatial processing gain to downlink
10 signal strength feedback from one or more subscribers.

1 22. A method comprising:
2 receiving channel characteristics and noise-plus-interference
3 information measured at spatially distributed subscribers; and
4 assigning traffic channels for an orthogonal frequency-division
5 multiple-access (OFDMA) network.

1 23. The method defined in Claim 22 wherein assigning traffic
2 channels is performed for the OFDMA network that uses spatial
3 multiplexing.

1 24. A method comprising:
2 each of a plurality of subscribers estimating channel gains and noise-
3 plus-interference levels of a set of OFDMA traffic channels in response to a
4 sounding signal;
5 the plurality of subscribers transmitting to a base station measured
6 channel and noise-plus-interference information;

7 at least one of the plurality of subscribers transmitting packets using
8 one or more allocated OFDMA traffic channels.

1 25. The method defined in Claim 24 wherein the plurality of
2 subscribers transmit the measured channel and noise-plus-interference
3 information on pre-allocated channels.

1 26. The method defined in Claim 24 wherein the plurality of
2 subscribers transmits the measured channel and noise-plus-interference
3 information when paged or when one or more of the plurality of subscribers
4 have a packet to transmit to the base station.

1 27. An apparatus comprising:
2 a channel and noise-plus-interference estimator;
3 an access signal generator coupled to the estimator;
4 an OFDM modem coupled to the generator.

1 28. The apparatus defined in Claim 27 wherein the estimator
2 estimates channel gains and noise-plus-interference levels in a pre-
3 determined set of traffic channels.

1 29. The apparatus defined in Claim 28 wherein the generator
2 encodes channel and noise-plus-interference information to form an access
3 signal.

1 30. The apparatus defined in Claim 29 wherein the OFDM modem
2 modulates the access signal and transmits a modulated version of the access
3 signal through an access channel.

1 31. The apparatus defined in Claim 30 wherein the access channel
2 comprises at least a subset of all traffic channels during an access time slot.

1 32. An apparatus comprising:
2 at least one spatially separated transceiver;
3 an access signal detector and demodulator coupled to the at least one
4 spatially separated transceivers;

5 a spatial channel and spatial gain estimator;
6 an uplink and downlink signal-to-noise-plus-interference estimator;
7 a multi-user traffic channel allocator coupled to the calculator, and
8 the estimator; and
9 an OFDM modem coupled to the allocator.

1 33. The apparatus defined in Claim 32 wherein the allocator
2 determines traffic channel assignment and a code and modulation
3 combination for each accessing subscriber, and the OFDM modem
4 modulates the traffic channel assignment and transmits a modulated version
5 of the traffic channel assignment to at least one subscriber.

1 34. The apparatus defined in Claim 33 wherein the allocator
2 determines traffic channel assignment based on broadband spatial channel
3 estimates from the estimator and measured channel and noise-plus-
4 interference information feedback from subscribers.

1 36. The apparatus defined in 34 wherein the access signal detector
2 and demodulator detects access signals transmitted by subscribers and
3 demodulates the measured channel and noise-plus-interference information
4 feedback from subscribers.